



**Client:** Inter-municipal Water company  
**Principal contractor:** THV Betonac/Smet-GWT  
**Execution:** 2004–2005

In 2005 the Betonac/Smet-GWT consortium started up the largest pellet reactor water softening project in Flanders to date, which was built for the Inter-municipal Water company of Hasselt and Zoutleeuw for a total capital investment of 4.5 million euros. This project enables the IWM water company to fulfil the increasingly stringent comfort requirements of its customers, who are constantly making harder demands for softer water.

### The purpose of water softening

The objectives of water softening are:

- reduce lime scale formation from the water, in order to increase user convenience.
- reduce the use of dishwashing and laundry detergents, in order to benefit the environment
- reduce the formation of lime scale on taps and shower heads.

After a comparative study of various water softening methods, taking into account the specified convenience and health requirements, IWM chose pellet reactors with calcium hydroxide dosing as the most suitable water softening method.

The requirements specification, the implementation supervision as well as the plant operation were closely monitored by an expert committee, which prior to the project formulated a number of stringent, clearly defined objectives regarding the water quality to be achieved.

### Design & build

Smet-GWT and Betonac joined forces to fully elaborate the *design* and build phases of the project. The architectural design had to fit with the existing infrastructure, taking into account urban planning regulations, and it had to be consistent with the selected water softening technology.



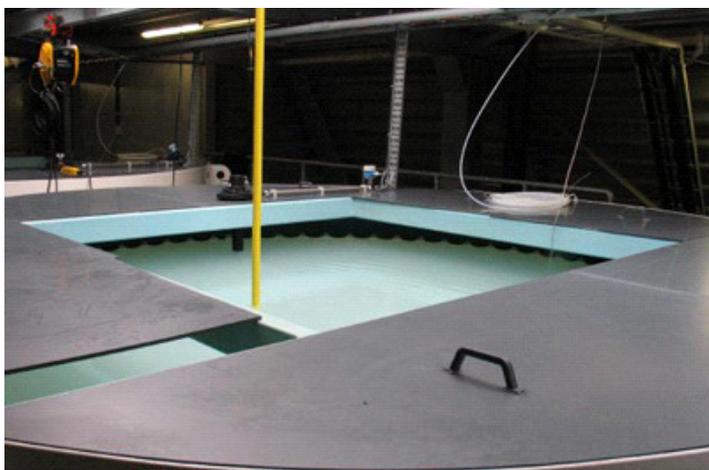
This formed the basis for the synergy between the two parties, with Betonac taking responsibility for the design and build of the civil engineering portion of the two buildings in Hasselt and Zoutleeuw.

Smet-GWT in turn was responsible for the design and build of all of the electromechanical equipment for water softening. The engineering of the hydraulic and electrical equipment was performed entirely by Smet-GWT in accordance with the most suitable technology, taking into account the specified requirements and in accordance with the process technology aspects necessary for achieving the specified results.

### The reactors

The engineers decided to install three identical pellet reactors in Hasselt and two reactors in Zoutleeuw, each with a treatment capacity of 250 m<sup>3</sup>/h. The reactors consist of open vessels with a height of 10 m, which are partially filled with sand disinfected by treatment with sodium hydroxide. After cascade aeration, the water to be treated flows through these reactors, causing fluidisation of the sand.

Calcium hydroxide is added at the top of the reactor by a dispenser. It causes the calcium carbonate or calcium in the water to precipitate on the sand grains.





The calcium deposits on the sand grains, effectively causing them to grow larger and become heavier. These sand grains coated with a layer of calcium are called pellets. The pellets are tapped off from the reactor, and a bit of sand is added to the reactor at the same time. All of this is done continuously, with no interruption to the process. The removed pellets are then discarded and can be used in agriculture, the smelting industry or the cement industry.

Due to the limited consumption of calcium hydroxide at both locations, it was decided to have ready-made calcium hydroxide delivered to the site and stored in a 20% solution with continuous stirring. To allow the distribution of calcium hydroxide on the reactor base to proceed optimally, the delivered calcium hydroxide is diluted in-line with decarbonated water to form a 2% solution.

The system is also designed to allow calcium hydroxide dosing to be replaced by sodium hydroxide dosing with a minimum of adjustments to the system.

The maximum degree of water softening is limited to the legally allowed hardness for centralized water distribution by a potable water company, which is 15 °F.



### Commissioning

The cornerstones for the two plants were laid on 27 October 2004. The Zoutleeuw plant was officially commissioned on 14 October 2005, and the Hasselt water softening plant was put into service a week later on 21 October, also witnessed by a large number of interested parties. The two water softening plants have now been in service for 18 months with very good results, as well as numerous satisfied reactions from plant operators and customers.

"Building two water softening plants on this scale using the selected method was not only a first for the client, but also for Smet-GWT as the main contractor for all of the electromechanical portions of the project, due to the design and build aspect of the project in which we were ultimately responsible for the design and practical implementation of the project", according to Jan Vanden Berg, Division Manager of Smet-GWT's Electromechanical Division. That's worth repeating.

A few key figures regarding the implemented plants:

CONSUMPTION	HASSELT	ZOUTLEEUW
Stabilised CaOH 20%	30 ton/week	37 ton/week
Hydrochloric acid 30%	52 ton/week	32 ton/week
Sand	161 ton/year	150 ton/year
NaOH 30%	100 litre/year	100 litre/year
Production of pellets or calcium carbonate	1075 ton/year	1040 ton/year
Number of reactors	3	2
Reactor height	10 m	10 m
Flow to be treated	750 m <sup>3</sup> /h	500 m <sup>3</sup> /h

